REMARKS

Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and in view of the reasons which follow. Claims 1-20 have been rejected, and the Examiner has objected to Claims 15 and 16. Claims 2, 12, 15, 16, and 20 have been amended. No new matter has been added by this amendment. Accordingly, Claims 1-20 remain pending in the present application.

The Specification has also been amended to correct typographical errors included therein. No new matter has been added by this amendment.

1. Objection to Specification

In Section 1 of the Office Action, the Specification is objected to "because the application numbers of the related applications are missing." By this Amendment, paragraph [0001] at page 1 of the Specification has been amended to include the application numbers of the related applications. Accordingly, Applicants respectfully request reconsideration and withdrawal of the objection to the Specification.

2. Claim Rejections – 35 U.S.C. § 112

In Section 3 of the Office Action, Claim 20 is rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 20 has been amended to recite "wherein the reflective metal layer has a thickness of between 80 and 200 Angstroms." Support for this amendment can be found in paragraph [0033] of the Specification, which states, "In an exemplary embodiment, reflective metal layer 214 containing tungsten has a thickness of 80-200 Angstroms."

In Section 5 of the Office Action, Claim 12 is rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 12 has been amended to recite "wherein the reflective metal layer is optically opaque to the gate material layer." Support for this amendment can be found in paragraph [0038] of the

Specification, which states, "Reflective metal layer 214 is optically opaque to polysilicon layer 216."

Applicants submit that the rejection of Claims 12 and 20 have been overcome by these amendments. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of Claims 12 and 20.

3. Claim Objections

In Section 6 of the Office Action, Claims 15 and 16 are objected to because of informalities. By this amendment, Claims 15 and 16 have been amended in accordance with the Examiner's suggestion to correct the typographical errors included therein. Accordingly, Applicants respectfully request reconsideration and withdrawal of the objections to Claims 15 and 16.

4. Claim Rejections – 35 U.S.C. § 103

In Section 8 of the Office Action, Claims 1-20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,883,011 to Lin et al. in view of U.S. Patent No. 5,346,587 to Doan et al. and U.S. Patent No. 5,804,088 to McKee et al. Applicants respectfully traverse the combination of Lin et al., Doan et al., and McKee et al. and the rejection of Claims 1-20.

For ease of reference, Lin et al., Doan et al., and McKee et al. are referred to below collectively as "the cited references."

(a) The combination of Lin et al., Doan et al., and McKee et al. is improper

The Examiner has not articulated any suggestion or motivation to combine the cited references in a manner that would render any of the claims of the present application obvious over the combination. The Examiner states at page 4 of the Office Action that

> Lin et al. do not teach forming a reflective metal material layer. However, Doan et al. (Fig. 3-5) in an analogous method to improve polysilicon gate patterning teach the step of depositing a reflective metal material layer (35) over a layer of polysilicon (column 2, lines 16-35). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to

> form the reflective metal layer of Doan et al. over the polysilicon of Lin et al. prior to depositing the anti-reflective coating, since using the reflective metal layer in the patterning process would avoid the formation of reflective notching, which in turn, would improve the reliability of the device.

With regard to McKee et al., the Examiner states at page 4 of the Office Action that

> Lin et al. in combination with Doan et al. fail to teach the step of trim (selectively) etching the ARC layer using an isotropic etching. However, McKee (Fig. 8a-d) in a related method to form field effect transistors teaches the step of selectively removing comprising trim etching the ARC layer using isotropic etching (column 5, line 23-column 6, line 17). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to trim etch the ARC as taught by McKee after the step of depositing an ARC over the reflective metal layer as taught by Lin et al. and Doan et al., since such process would provide a lateral removal of the ARC layer, thus gives a new pattern to form shorter linewidths to the polysilicon layer.

There is no suggestion that the cited references could be combined in the manner suggested by the Examiner. For example, there is no suggestion that the reflective material 35 of Doan et al. could be used to replace the sacrificial material layer 106 of Lin et al. Lin et al. discloses a BARC layer 108 formed on the sacrificial layer 106. There is no suggestion in either Lin et al. or Doan et al. that it would be possible or even desirable to form a BARC layer on a reflective material, such as reflective material 35 of Doan et al.

In another example, there is no suggestion that the anisotropic etch of a BARC layer 808 disclosed in McKee et al. could be used with an underlying reflective layer (such as reflective layer 35 of Doan et al.), or that it would even be desirable to do so. In McKee, the layer underlying the BARC layer is polysilicon, as opposed to a reflective metal or other material.

To obtain the result suggested by the Examiner, the cited references must be modified in a manner that is only suggested by the Applicants' own disclosure. Taking selected elements from various references without a suggestion to do so constitutes improper hindsight reconstruction.

Since there is no suggestion or motivation to combine the cited references, the combination of these references is improper. Reconsideration and withdrawal of the rejection of Claims 1-20 is therefore respectfully requested.

(b) Claims 1-20 are not obvious over the combination of Lin et al., Doan et al., and McKee et al.

Even if the cited references could be properly combined, Claims 1-20 were not obvious at the time the invention was made to one of ordinary skill in the art in view of the cited references, either alone or in combination.

For example, Claim 1 recites "depositing an anti-reflective coating over the reflective metal material layer." Claim 14 recites "providing an anti-reflective coating (ARC) layer over the reflective metal layer." None of the cited references, alone or in combination, teach or suggest depositing or providing an anti-reflective coating over a reflective metal or metal material layer.

In contrast, Lin et al. does not even teach or suggest forming a reflective metal or metal material layer, as explicitly noted by the Examiner. The BARC layer 108 of Lin et al. is formed on sacrificial layer 106, and is not formed on a reflective metal or metal material layer. (Col. 4, lines 22-24.) McKee et al. also does not teach or suggest forming a reflective metal or metal material layer. The BARC layer 808 of McKee et al. is deposited onto polysilicon 806. (Col. 5, lines 30-32.) While Doan et al. does disclose a layer of reflective material 35, there is no teaching or suggestion that an anti-reflective material is deposited or provided over the reflective material 35. (Col. 2, lines 28-31.) Doan et al. does state that "planarized polysilicon 34 and silicide 35 are patterned to form planarized conductive strips 41" (Col. 2, lines 36-39), although there is no teaching or suggestion that this involves deposition or formation of an anti-reflective layer.

In another example, Claim 1 recites "trim etching the anti-reflective coating to form a pattern; etching the reflective metal material layer according to the pattern." Claim 7 recites "patterning the gate material layer including selectively etching the mask layer and the reflective metal layer." Claim 14 recites "patterning a gate structure in the gate material layer by selectively removing portions of the resist layer,

ARC layer, and gate material layer." None of the cited references, alone or in combination, teach or suggest these limitations.

With regard to Claim 1, none of the cited references teach or suggest etching a reflective metal material according to a pattern formed in an anti-reflective coating. As described above, the only reference that suggests a reflective metal material layer is Doan et al. The reflective material layer 35 of Doan et al. is not etched according to a pattern formed in an anti-reflective coating layer, nor is there any suggestion in any of the other cited references that a reflective metal material could be etched according to a pattern formed in an anti-reflective coating.

With regard to Claim 7, none of the cited references teach or suggest patterning a gate material layer by selectively etching both a mask layer and a reflective metal layer. Again, the only reference that suggests a reflective metal layer is Doan et al., and that reference does not teach or suggest the formation of a mask layer over the reflective metal layer, as required by Claim 7. Further, none of the cited references teach or suggest forming a mask layer over the reflective layer and selectively etching both the mask layer and the reflective metal layer to pattern a gate material.

With regard to Claim 14, none of the cited references teach or suggest patterning a gate structure in a gate material layer by selectively removing portions of a resist layer, an ARC layer, and the gate material layer where a reflective metal layer is provided over the gate material layer and the ARC layer is provided over the reflective material layer. As described above, the only reference that suggests a reflective metal layer is Doan et al., and Doan et al. does not suggest an ARC layer provided over the reflective metal layer. Nor do any of the other cited references suggest an ARC layer provided above a reflective metal layer.

The rejection of independent Claims 1, 7, and 14 cannot be maintained, because at least one limitation in each of these claims is not taught or suggested by the cited references, either alone or in combination. The rejection of dependent Claims 2-6, 8-13, and 15-20 also cannot be maintained, because these claims depend variously from Claims 1, 7, and 14, and therefore include all limitations of the

independent claims from which they depend. Reconsideration and withdrawal of the rejection of Claims 1-20 is therefore respectfully requested.

In addition to the reasons described above, various dependent claims are also allowable over the cited art. For example, Claims 5 and 10 recite that the reflective metal or metal material layer "has a thickness of 80-200 Angstroms." None of the cited references teach or suggest a reflective metal or material layer having a thickness of 80-200 Angstroms. The only reference to suggest a reflective metal or metal material layer is Doan et al., which does not even disclose a thickness for layer 35. Because no range of thicknesses is specified, the thickness of 80-200 Angstroms is not taught or suggested by Doan et al. or any of the other cited references.

In another example, Claim 11 recites that "the step of providing a mask layer comprises depositing a layer of SiON and a layer of resist." None of the cited references teach or suggest depositing a layer of SiON and a layer of resist over a reflective metal layer, as required by Claim 11. With regard to Lin et al., the BARC layer 108 (which may be SiON) and photoresist material 110 are deposited over a sacrificial layer 106 that is not a reflective layer. None of the cited references, however, show a SiON layer and a layer of resist deposited over a reflective metal layer.

Claim 17 recites "wherein the ARC layer comprises SiON" and Claim 19 recites "wherein the ARC layer is SiON." For similar reasons as described above with regard to Claim 11, none of the cited references teach or suggest providing a SiON ARC layer over a reflective metal layer.

Additionally, other dependent claims may also be allowable for various other reasons, and the examples provided above are by no means considered to be exclusive. Applicants reserve the right to argue the patentability of any of Claims 1-20.

* * *

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

Respectfully submitted,

Date 7/3/02

By _____

FOLEY & LARDNER
Firstar Center
777 East Wisconsin Avenue
Milwaukee, Wisconsin 53202-5367
Telephone: (414) 297-5564
Facsimile: (414) 297-4900

Marcus W. Sprow
Attorney for Applicant
Registration No. 48,580

VERSON WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

[0001] This application is related to U.S. patent Application No. [_____] 09/845,656, Attorney Docket No. 39153/366 (F0807), entitled USE OF SILICON CONTAINING IMAGING LAYER TO DEFINE SUB-RESOLUTION GATE STRUCTURES, and U.S. Patent Application No. [_____] 09/845,649, Attorney Docket No. 39153/367 (F0808), entitled BI-LAYER TRIM ETCH PROCESS TO FORM INTEGRATED CIRCUIT GATE STRUCTURES, both of which are assigned to the same assignee as this application and are filed on an even day herewith.

[0004] One limitation to achieving smaller sizes of IC device features is the capability of conventional lithography. Lithography is the process by which a pattern or image is transferred from one medium to another. Conventional IC lithography uses ultra-violet (UV) sensitive photoresist. Ultra-violet light is projected to the photoresist through a [reticule] reticle or mask to create device patterns on an IC. Conventional IC lithographic processes are limited in their ability to print small features, such as contacts, trenches, polysilicon lines or gate structures.

[0032] Reflective metal layer 214 can be tungsten (W) or any other reflective metal. ARC layer 216 can be SiN, SiON, SiRN, or any other suitable material having appropriate anti-reflective properties. ARC layer 216 is located above reflective metal layer 214 and polysilicon layer 212. In an exemplary embodiment, ARC layer [1216has] 216 has a thickness of 400-800 Angstroms and reflective metal layer 214 has a thickness of 80-200 Angstroms.

In the claims:

2. (Once Amended) The method of claim 1, further comprising depositing a resist layer over the anti-reflective coating. [;]

12. (Once Amended) The method of claim 7, wherein the reflective metal layer is [not matched] optically opaque to the gate material layer.

15. (Once Amended) The method of claim 14, wherein the reflective [material] metal layer comprises tungsten (W).

16. (Once Amended) The method of claim 14, wherein the metal [reflective] material layer has a thickness of approximately 100 Angstroms.

20. (Once Amended) The method of claim 19, wherein the reflective metal layer [is less than 100] has a thickness of between 80 and 200 Angstroms [thick].